

### Points, lines and planes

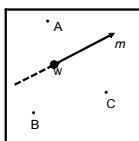
Recall that a point is a dimensionless object. Still, a point has some presence. For example, if two lines intersect, they intersect at a point. If a line intersects a plane, it does so at a point.

A line has only one dimension: in the direction of its travel or endpoint(s).

A plane has two dimensions. These dimensions can be described by any three points that are not colinear. (Colinear points would merely cover the line that connects them.)

A rule of thumb is that **if you can draw a triangle with three arbitrary points, then those points define a plane.**

**Two planes intersect in a line. Three planes intersect at a point or a line.**



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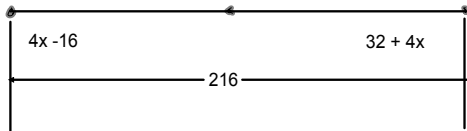
### Examples of intersections

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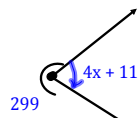
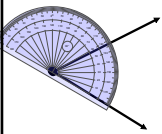
### Measuring segments

We can measure segments physically or through calculations.

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Similarly we may measure angles by measuring (with a protractor) or by calculations.



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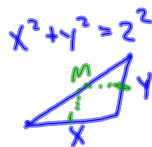
### Midpoint and Distance

We know the formulas for midpoint and distance, so it can be as easy as "plugging in numbers". However, we may have to perform some algebra, too.

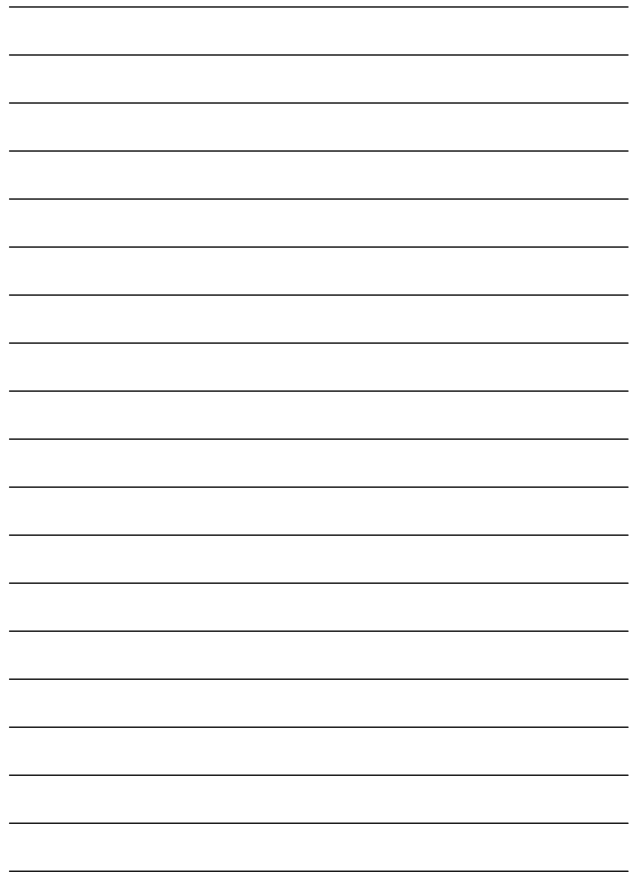
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$m = (x, y)$$



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